Research Article

Caulerpa lentillifera Used in the Development of Biodegradable Plastics for a Sustainable Environment

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Abstract: *The need for plastic solutions has increased as a result of the expansion in the usage of plastic-based items, adding pressure to the waste management system. The use of plastics derived from petroleum, which significantly harm the environment, is being reduced with great interest. Substituting biodegradable plastic made from natural resources such as unprocessed agricultural waste, aquatic life, and even microbes for traditional plastics made through the petrochemical process is one way to address the problems. The worldwide bioplastics and biopolymer targets are the focus of all these initiatives. The focus of this study is on the sea grape, or Caulerpa lentillifera. The Caulerpa lentillifera plant, which is widely distributed along Sabah's east coast and in the Malacca Strait and is significant economically in Malaysia, was also mentioned. It possesses antibacterial qualities and is found in abundance there. The goal of the innovation project is to create biodegradable plastic from Caulerpa lentillifera and test the anti-microbial capabilities of the plastic. It is anticipated that this novel product will benefit society and have a high likelihood of being commercialized. Due to its remarkable biodegradability, the use of biodegradable plastic has recently become more popular. It is very simple to stretch and can lessen the environmental impact because it does not release carbon dioxide. Additionally, it does not produce a lot of hazardous emissions and has the potential to biodegrade into a natural component that blends into the soil. Additionally, biodegradable packaging has found use in several industries such as consumer goods and medical technology. The Sustainable Development Goals (SDGs) established by the United Nations, particularly SDG 14 which focuses on the conservation and sustainable use of marine resources, are also in line with this unique idea.*

Keywords: Algae; Bioplastics; Caulerpa lentillifera; Marine; Sustainability; Seaweed

1. INTRODUCTION

Given the depletion of petroleum supplies and the negative effects that traditional plastics have on the environment, biodegradable plastics are currently being investigated extensively as a replacement for conventional plastics (Cinar et al., 2020). As a result of the recent development in biodegradable plastics, there is now a push to produce plastic using natural resources such as those from plants, animals, and even microbes to satisfy international bioplastics and biopolymer targets (Abdul Khalil et al., 2017). The use of marine algae in the creation of new biodegradable polymers is among the subjects that receive the most discussion in the area (Doh et al., 2020). Only a small number of investigations have been conducted on the marine alga *Caulerpa lentillifera*. Medical research from 2019 shows that *Caulerpa lentillifera* has anti-microbial qualities and is efficient against gram-negative bacteria (Le et al., 2022). Therefore, it is anticipated that the use of *Caulerpa lentillifera* in the production of biodegradable plastics may help combat harmful germs and stop the spread of illnesses. The purpose of this project is to produce biodegradable plastics from the specified algae and evaluate their anti-microbial capabilities. The preparation of biofilms follows simple steps of mixing the ingredients, heating, stirring until becoming a smooth solution, and moulding. The biofilm can be removed and used in a variety of ways once it has dried and become firm.

The objective of this innovation project is to produce biodegradable plastics from *Caulerpa lentillifera* for a sustainable environment.

2. METHOD

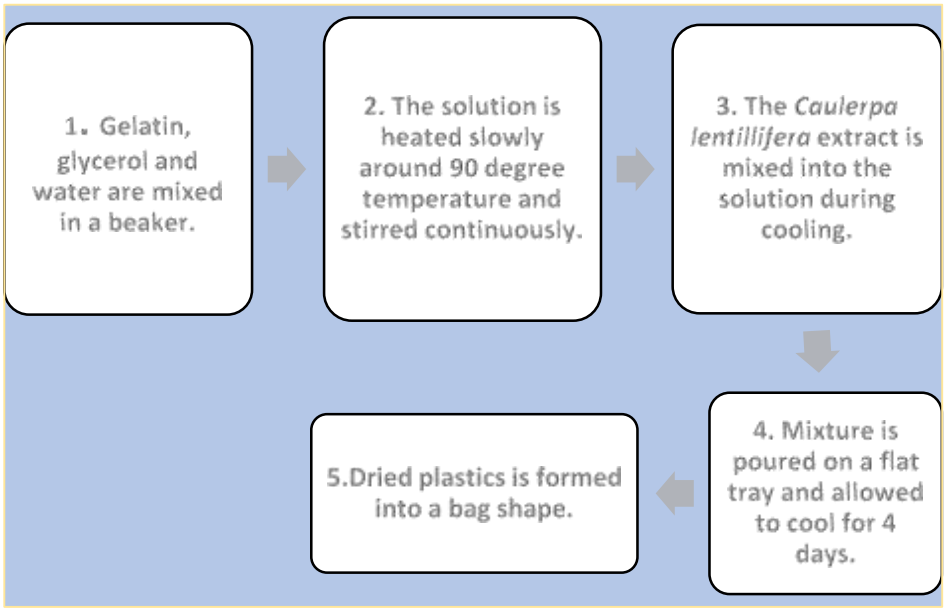

Figure 1. The Method of Plastic Creation using *Caulerpa Lentillifera.*

3. FINDINGS

3.1 Novelty and Uniqueness

The addition of cellulose improves the characteristics of several bioplastics, including those based on starch and hemicellulose, and *Caulerpa lentillifera* is an excellent source of cellulose (Baghel et al., 2021). Cellulose is a polymer that interacts easily with both water and microorganisms and is easily degraded due to its vulnerability to physicochemical effects (Kadar et al., 2021). However, *Caulerpa*

lentillifera has anti-bacterial qualities that may delay the cellulose's impending biodegradation, making it a good test for durable biodegradable plastic.

3.2 Benefit to Mankind

Since it has an outstanding biodegradable quality, awareness of using biodegradable plastic has grown recently. It is quite simple to stretch, and using it contributes to reducing the carbon footprint. Biodegradable plastic indirectly lessens the climate effect by not releasing carbon dioxide gas (Moshood et al., 2022). Furthermore, it can biodegrade into a safe natural component that combines with the soil and does not produce a lot of dangerous emissions. Additionally, biodegradable packaging has been utilized in agricultural, consumer, medical and automotive products.

3.3 Commercialisation Potential

As a result of increasing research and development initiatives, greater environmental awareness, and the implementation of severe environmental legislation, the market is expanding. Biodegradable plastics can be used in a wide range of commercial applications. It is believed that disposable household items and packaging are what is driving the biodegradable market. Foam packaging continues to have a substantial market share for biodegradable polymers. Foam packaging is followed in terms of volume by compostable bags and single-use carrier plastic bags.

4. CONCLUSION

Overall, *Caulerpa lentilifera* extract can be incorporated into bioplastics due to its anti-microbial property and the renewable material was found in abundance on the coasts of Malaysia. Therefore, the bioplastics created may have commercialised potential in the field of packaging.

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